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Review

Unpacking components of sustainable and resilient urban food systems

Leticia Canal Vieira [a, *], Silvia Serrao-Neumann [a, b], Michael Howes [c], Brendan Mackey [d]

[a] Cities Research Institute, Nathan Campus, Griffith University, 170 Kessels Road, QLD, 4111, Australia
[b] Faculty of Arts and Social Sciences, The University of Waikato, Private Bag 3150, Hamilton, 3240, New Zealand
[c] Cities Research Institute, School of Environment and Science, Gold Coast Campus, Griffith University, Parklands Drive, QLD, 4222, Australia
[d] Griffith Climate Change Response Program, Gold Coast Campus, Griffith University, Parklands Drive, QLD, 4222, Australia

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ABSTRACT

Urban food systems are connected with several pressing issues, including urban population growth, resource scarcity, and climate change. To cope within these issues, urban food systems need to become more sustainable in their practices, as well as resilient in the face of extreme weather events. While scholars have started to investigate this topic, no comprehensive analysis has yet addressed what entails sustainable and resilient urban food systems. Through a systematic review of the literature, this paper aims to improve our understanding of the key components of sustainable and resilient urban food systems. This study reviewed 53 publications and identified components related to the health, social, economy, environment, and governance domains. Only 5 of the works included in the review discussed sustainability and resilience to the impacts of climate change in urban food systems simultaneously, so there is an opportunity for original research and analysis. The most frequently identified components of urban food systems relate to: access to healthy food; connectivity between urban and rural areas; having a strong local food economy and food production; reducing food waste; and, having active participation of all actors in decision making. There is some level of consensus on linking sustainability and resilience, but diversity in food sources and the development of social capabilities need to be emphasised for climate change adaptation.

Contents

* Corresponding author.
E-mail addresses: leticia.canalvieira@griffithuni.edu.au (L.C. Vieira), s.neumann@waikato.co.nz (S. Serrao-Neumann), m.howes@griffith.edu.au (M. Howes), b.mackey@griffith.edu.au (B. Mackey).

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1. Introduction

The current concentration of the world's population in urban areas increases the centralisation of food systems and creates concerns about their long-term sustainability (Grewal and Grewal, 2012). To address such concerns there are calls for urban food systems (UFS) to be conceptualised at a more localised level (Matacena, 2016). UFS comprise activities and actors related with food supply to an urban area as well as their interaction with the surrounding natural and constructed environments, socio-economic dynamics, and governance (Dubbeling et al., 2016; Meerow et al., 2016). UFS are currently characterised by the scarcity of urban-rural linkages, resulting in more dependence on industrialised food supply chains that have global sources and are based on mass production (Forster et al., 2015; Sonnino, 2009). There are increasingly reduced numbers of retailers in charge of food distribution, resulting in restricted options for producers and consumers (Jennings et al., 2015; Roggema and Spangenberg, 2015). Consumers of UFS are largely unaware of the origin of their food, making it easier for the social, ecological, and economic components of food systems to remain unsustainable (Kirschenmann, 2008; Roggema and Spangenberg, 2015).

UFS also contribute to increased greenhouse gas (GHG) emissions, biodiversity loss and have high levels of waste (Goldstein et al., 2016; IPES FOOD, 2015). In addition, UFS need to improve their contribution to human health (Cretella, 2016). In particular, there are still communities in urban areas that have inadequate access to healthy and affordable food, both in developed and developing countries (Bedore, 2010). Indices of malnutrition, eating disorders, and obesity in countries classified as developed suggest that even sufficient food availability will not guarantee healthier diets nor food security (Koc, 2010, p. 39). These problems will become even more challenging with population growth and increased urbanisation. The added problem of climate change reinforces the need for new development pathways seeking low carbon UFS that are both able to adapt and more resilient to potential impacts (Custot et al., 2012; Edwards and Mercer, 2010). The need for more sustainable and resilient UFS is also encapsulated in several of the United Nations Sustainable Development Goals (United Nations, 2015). The links are present on the need to: improve nutrition and promote sustainable agriculture (Goal 2); improve health and well-being (Goal 3); make cities more inclusive, resilient, and sustainable (Goal 11); ensure sustainable consumption and production (Goal 12); and, both mitigate climate change and adapt to its impacts (Goal 13).

There is an opportunity to generate disruptive changes and new directions for UFS using the approaches of sustainability and resilience (James and Friel, 2015; Jennings et al., 2015). However, the link between the two approaches in UFS needs to be further developed in order to build an appropriate response to climate change (Lamine, 2015). This paper takes up this challenge through a systematic review of the relevant literature and explores the key components of UFS that are both sustainable and resilient. To this end, the paper is based on the premises that sustainable UFS not only serve society from an economic perspective but also operate within the Earth's carrying capacity (Giddings et al., 2002) and resilient UFS have the ability to persist under stress, adapt, and ultimately transform themselves (Folke, 2016). The two concepts are considered here as separate approaches, but they actually complement each other since resilient UFS are not necessarily sustainable, and even if UFS are sustainable they will need to be resilient to external influences, such as climate change. The paper addresses the following research question: What comprises, or can be understood as, sustainable and resilient UFS? The next section outlines the method used for the systematic review of the literature. The paper then presents and discusses key findings relating to components of sustainable and resilient UFS across 5 domains: health, social, economy, environment, and governance. The final section explores the links between sustainable and resilient approaches to UFS, along with directions for future research.

2. Method

This systematic literature review followed the strategy of Pickering and Byrne (2014) and the review protocol of Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) (Moher et al., 2009). This method creates a transparent and replicable process and allows for the quantification of studies related to each component of sustainable and resilient UFS (Tranfield et al., 2003). The following subsections describe the sequence of tasks carried out to complete the systematic literature review.

2.1. Exploratory search and review strategy

To create a review strategy, an exploratory search was undertaken to identify the key definitions of terms and concepts relating to sustainability and resilience. This search indicated that it was necessary to explore these concepts separately as they were rarely grouped together by existing studies. The review was designed to address the following main research question:

- What comprises, or can be understood as, sustainable and resilient UFS?

Sub questions were developed as stepping stones to addressing the main research questions:

- What are UFS?
- What are the components related to sustainable UFS?
- What are the components related to resilient UFS?

Starting with these questions, keywords were identified, relevant databases were selected, and search algorithms were established (see Table 1). The definition of the keywords delimited the review to components of sustainable and resilient UFS, but excluded the discussion on food security. Additionally, albeit their relevance to current debate on food studies generally, certain bodies of literature such as the water-energy-food nexus were not captured by the review. Nevertheless, Galaitsi et al. (2018) reviewed works using the water-energy-food nexus concept and found out a lack of theoretical consistency among them. Considering further limitations, although the components found in the review are related to planning and policy aspects at the local level, exploring this relationship in more details falls outside the scope of this paper. The review was also limited to literature published in English.

Searches were conducted using the Scopus and Web of Science databases. No limitation in terms of publication years was specified. Considering that UFS are predominantly the subject of local policies, grey literature was included in the review (i.e. local government plans and reports), a practice recommended by the International Panel of Experts on Sustainable Food Systems (IPES FOOD, 2015). Additionally, a search of Google Scholar was conducted using the algorithm presented in Table 1. Additional searches using the term 'urban food system' were conducted using the International Urban Food Network (IFUN) and the Food Climate Research Network (FCRN) databases, since they are institutions concerned with the development of sustainable UFS.

Table 1
List of databases, keywords and algorithms used in the exploratory search.

Databases	Keywords and search algorithm
Google Scholar	allintitle: sustainable OR resilient "urban food systems" OR "urban food strategies" OR "city region food system"
IFUN	Urban food systems
FCRN	*All publications in the resources page*
Scopus	TITLE-ABS-KEY (("urban food" W/0 system* OR network* OR "supply chain" OR strateg* OR plan*) OR "city region food systems") AND (sustainab* OR resilien*)
Web of Science	TS= ("urban food" NEAR/0 (system* OR network* OR "supply chain" OR strateg* OR plan*)) OR TS= ("city region food systems") AND TS = ((sustainab* OR resilien*))

2.2. Preliminary search and content evaluation

The search of all the databases produced 428 items. The titles and abstracts of peer-reviewed papers and book chapters were used to determine whether the publication was suitable for inclusion in the review. With respect to the grey literature, the summary content was examined, followed by a brief scan of the whole document. To be included in the analysis, publications had to meet the following criteria:

- The adoption of the UFS approach (i.e. the work should refer to more than one stage (such as production) of the food supply system, and it should be concerned with food supply in urban areas).
- The consideration of sustainability and/or resilience in relation to UFS.

As a result of this process, 89 publications remained after the filtering process for full examination, with the data regarding type, year, author, title, journal/book, and country, being recorded in an Excel spreadsheet.

2.3. Coding and cross search

The most frequent topics identified in the 89 reviewed publications were used to create the initial nodes for the coding process. Table 2 presents the initial nodes used and their description,

Table 2
Coding scheme used in the preliminary search and content evaluation.

Preliminary nodes	
Context	*Resilience* *Sustainability* *Climate change*
Glossary	*All relevant terms, including urban food system*
Further Research	

Nodes	**Description**
Promotion of health	Production of, and access to, healthy food must take place. Education on nutrition to empower members of the system to make better dietary decisions should take place.
Social justice	The system must comprise participatory democratic institutions that pursue equality.
Localised food system	It is necessary to preserve and increase regional and urban food production, ensuring the existence of resources. Shorter supply chains must be fostered and loops closed within city systems. This does not mean that all food items need to be locally supplied, but this should be encouraged.
Diversity	Diversity of food sources, actors and networks must be pursued, creating a system with different options and possibilities of choice along its parts.
Community development	Existence of a community sense and networks of support to enable sharing of information, knowledge and resources, and need for cooperation.
Connectivity between urban and rural	This connection needs to occur both in hard (roads, processing, storage) and soft infrastructure (knowledge, culture and social support).
Fair trade	Fair and equitable economic benefits to all participants of the system are generated.
Stronger and vibrant local economy	Support for regional and local community food enterprises is provided in addition to urban and peri-urban agriculture. Citizens' participation as producers as well as consumers of the food system is encouraged. Incentives for street food vendors are available.
Environmental stewardship	The system should maintain ecosystem services, reducing greenhouse gas emissions, its ecological footprint and waste generation. Respect to the seasonality of food should also be considered.
Ability to adapt	Parts of the system should be able to anticipate and successfully adapt to changes and shocks ahead. Vulnerabilities and potentials of the food system are understood.
Balance between local, regional and global	In general, a more local system is necessary, including cases of more reasonable regional and global sources. Binaries such as local or global sources should be avoided. Regional links are especially encouraged.

according to what was stated in the literature reviewed. The documents were uploaded to NVivo software (QRS, 2017) and a full reading of each item was conducted, resulting in 53 documents being included in the final review. Additionally, a glossary was built with passages that concerned the definition of key terms. Relevant cited references that were not captured by the searches and mentioned in publications present in the review were included (comprising 7 publications of the total).

2.4. Results synthesis

First, a demographic analysis of the studies was conducted. Then the components related to sustainable and/or resilient UFS were extracted from the passages coded in the initial nodes. The nature of the components allowed them to be organised in 5 dimensions: health, social, economy, environment and governance. The choice of the dimensions emerged from the data. Urban food strategies presented more explicitly components expected to achieve sustainability or resilience and they tended to use a mix of these dimensions. It was also observed whether components referred to specific stages of the food system or whether they had a general approach. The prevalence of mentions of each component was noted and linked to the type of literature. It was then possible to identify the more frequently mentioned components, as well as similarities or differences between components associated with a sustainable and/or a resilient UFS.

3. Results and discussion

3.1. Demographics of the studies considered in the review

In total, 53 publications were analysed. Table 3 presents the distribution of the publications with regards to published year, the country of origin, and the type of publication. There was a significant increase in the number of relevant publications published after 2011, with 2016 being the peak (12 publications). The two most common countries of origin were the United Kingdom (11) and the United States of America (8). A significant number of studies involved collaborations between authors from different countries (11). The majority of publications were peer-reviewed journal articles (21), followed by reports (19), book chapters (9), a handbook (1), and a conference paper (1). Notably, there was a large contribution from the grey literature, especially in the form of urban food strategies.

3.2. Overview of publications

Table 4 presents the relationship between publications concerned with sustainability and/or resilience, and the stages of the food system to which they refer. Most studies approach the food system in a holistic manner. When specific stages are the main focus, however, there is an emphasis on production and consumption. The only stage that did not get a specific mention was processing. This may be because food processing is related to industrial practices and there are other areas of research dealing with sustainable and resilient food industries.

3.3. UFS definition

As publications included in this review adopted the UFS approach they were concerned with activities related to the production, processing, transportation, retail, consumption, and disposal of food that occur within urban/peri-urban areas and their rural hinterland (Dubbeling et al., 2016). Ericksen (2008) contends that food security is the main outcome expected from UFS, but there are other related implications such as health, environmental, social, and political. Some studies note that UFS can also affect labour markets, patterns of migration between urban and rural areas, ecosystem services, and public health (Forster et al., 2015; Jennings et al., 2015). Dowding-Smith (2013) outlines that the UFS approach considers actions at a local-scale and develops an understanding of interactions between participants and their surrounding ecosystems. An example comes from Dumangas (in The Philippines) where indigenous knowledge is being combined with weather forecasts to deal with food production in drought and flood prone areas, enhancing the capacity of local institutions, communities, and rural women (Dowding-Smith, 2013).

The idea of creating a more localised food system is strongly present in many of the reviewed publications and it entails provision of resources by local actors, shorter supply chains, and the containment of material and energy flows within regional boundaries (Desmarais and Wittman, 2014; Dowding-Smith, 2013; Dubbeling et al., 2016; Forster et al., 2015; Jones, 2010; Larsen et al., 2008). Nevertheless, there is a consensus among some studies (Anderson, 2015; Bedore, 2010; Edwards and Mercer, 2010; Hall et al., 2014; Morgan and Sonnino, 2010; RUAF, 2013; Sonnino, 2016; Sonnino and Spayde, 2014) that producing all food locally is not a panacea for achieving sustainable and resilient UFS, and may not even be the best option in some cases. Sonnino (2016), for example, suggests that a more local food system should be seen more as a means rather than an end in itself. Nevertheless, the large food chains that currently dominate food systems are far from being adequate and the pursuit of localisation at a certain scale will be necessary.

Some cities are already working towards managing their food systems at the urban scale, including: Bristol (Bristol City Council, 2013), New York (The New York City Council, 2010), San Francisco (Jones, 2010), Toronto (Toronto Public Health, 2010), Malmö (City of Malmo, 2010), Vancouver (Metro Vancouver, 2016), Manchester (Food Futures, 2007), and Melbourne (Carey et al., 2016). Commonalities noted in urban food strategies included in this review were also captured by other studies, including the use of a sustainable development framework and the pursuit of links between different policy domains (Cretella, 2016; Mansfield and Mendes, 2013). It is important to emphasise, as contended by Cretella (2016), that urban food strategies are not concerned only with the geographical delimitation of an urban area, rather they attempt to create a feasible political unit to deliver the desired outcomes.

Overall, while sustainability has been linked to UFS in most of the publications reviewed, the additional link to resilience seemed to be neglected. Only five publications suggest that UFS should entail both sustainability and resilience (James and Friel, 2015; Jennings et al., 2015; RUAF, 2013; Toronto Public Health, 2010; Wiskerke, 2015). The necessary components for a sustainable and resilient UFS were, however, not well developed.

3.4. Sustainable UFS

From the 53 publications analysed in this review, 38 dealt with sustainability (15 peer reviewed journal articles, 8 book chapters, and 15 grey literature items - reports, handbook, and conference paper). This number includes the 5 publications that refer to both sustainability and resilience. In the following sections the components of sustainable UFS are presented and those are related back to the 5 domains (i.e. health, social, economy, environment and governance) that were listed in the methods section of this paper. In some cases, it was not possible to distinguish a specific stage of the UFS, so the component was assigned as general. Food system stages that had no specific components were not included in the

Table 3
Demographic data of publications included in the systematic review.

ID	Authors	Year			Origin													Type				
		1999 - 2004	2005 - 2010	2011 - 2017	Australia	Canada	France	Germany	Greece	Italy	Netherlands	Nigeria	Sweden	UK	USA	Europe	International	Journal Article	Book Chapter	Report	Handbook	Conference
1	American Planning Association			■											■					■		
2	Anderson, M. D.			■											■			■				
3	Billen, G. et al.			■			■											■				
4	Blay-Palmer, A.		■			■													■			
5	Bristol City Council			■										■						■		
6	Carey, J.			■										■				■				
7	Cretella, A.			■							■								■			
8	Cretella, A.; Buenger, M. S.			■							■							■				
9	Custot, J. et al.			■													■					
10	Desmarais, A. A.; Wittman, H.			■		■												■				
11	Donald, B.			■		■													■			
12	Donovan, J.; Larsen, K.; McWhinnie, J. A.			■	■															■		
13	Dowding-Smith, E.			■				■												■		
14	Dubbeling, M.; et al.			■												■				■		
15	Edwards, F. and Mercer, D.		■		■													■				
16	Food Futures		■											■						■		
17	Forster, T. et al.			■													■	■				
18	Garnett, T.			■										■				■				
19	Hall, G. et al.			■	■													■				
20	Hamm, M.W.; Baron, M.	■													■				■			
21	Hanson, L. L. and Schrader, D.			■		■													■			
22	Hinrichs, C.		■												■				■			
23	IPES FOOD			■													■			■		
24	James, S. W; Friel, S.			■	■													■				
25	Jegou, F.; Carey, J.			■												■					■	
26	Jennings, S. et al.			■												■				■		
27	Jones, P.		■												■					■		
28	Karg, H. et al.			■													■	■				
29	Keck, M.; Etzold, B.			■				■										■				
30	Larsen, K.; Ryan C.; Abraham, A. B.		■		■															■		
31	Longo, P.			■											■			■				
32	Marsden, T.; Morley, A.			■										■					■			
33	Metro Vancouver			■		■														■		
34	Moragues-Faus, A.; Marceau, A.; Andrews, T.			■										■						■		
35	Morgan, K.			■										■				■				
36	Morgan, K.; Sonnino, R.		■											■				■				
37	Ozor, N.; Enete, A.; Amechina, E.			■								■						■				
38	Prosperi, P. et al.			■										■						■		
39	Roggema, R.; Spangenberg, J.			■							■											■
40	RUAF			■													■			■		
41	Sonnino, R.			■										■				■				
42	Sonnino, R.; Moragues Faus, A.; Maggio, A.			■												■		■				
43	Sonnino, R.; Spayde, J. J.			■										■					■			
44	Taqtow, A. M.; Roberts, S. L.			■											■					■		
45	The New York City Council		■												■					■		
46	Toronto Public Health		■			■														■		
47	Toth, A.; Stacy, R.; Femke, R.			■													■	■				
48	Wiskerke, J. S.C.			■							■								■			
49	Calori, A.; Dansero, E.; Pettenati, G.; Toldo, A.			■						■								■				
50	Skordili, S.			■					■									■				
51	Bottiglieri, M.; Pettenati, G.; Toldo A.			■						■										■		
52	Moragues-Faus, Ana.; Morgan, Kevin			■												■		■				
53	City of Malmo		■										■							■		
	TOTAL (n=53)	1	10	42	5	6	1	2	1	2	4	1	1	11	8	5	6	21	9	19	1	1

table. The publications were divided between peer-reviewed (PR) journal articles, book chapters (BC), and grey literature (GL). They are identified by the ID numbers assigned in Table 3.

3.4.1. Health

Nineteen of the 38 publications dealing with sustainability mention components related to the health domain (see Table 5).

Table 4
Number of publications that mentioned specific food system stages with regards to sustainability and/or resilience.

Food system stages	Related concept			Total[a]
	Sustainability	Resilience	Both	
Production	18	5	2	**25**
Process	–	–	–	**-**
Transportation	1	–	1	**2**
Retail	4	3	2	**9**
Consumption	16	2	3	**21**
Disposal	6	–	3	**9**
General	34	8	5	**47**
Total	**79**	**18**	**16**	

[a] Note: some publications contained more than one category.

These were associated with the UFS stages of food production (1), consumption (19), and general aspects (6). The consumption stage received the highest number of references, especially regarding access to healthy food. This might be an indication of how access to healthy food needs to be improved, even when food availability is sufficient. The lack of access to healthy food has connections with the social domain since it may be linked to low socio-economic status. Sustainable UFS also need to generate public health benefits. The need to improve the quality of urban diets comes from the potential that adequate nutrition has to reduce diseases, as asserted by James and Friel (2015) and Morgan (2015). The city of San Francisco, for example, acknowledges in its urban food strategy that poor nutrition of its residents is a pressing health issue that needs to be addressed (Jones, 2010).

3.4.2. Social

Thirty works mentioned components related to the social domain (see Table 6). These related to the UFS stages of production (7), consumption (8), and general aspects (27). The typology of the studies included PR (9), BC (6), and GL (11), indicating a balanced distribution across the types of publications. The component that refers to the need for increasing knowledge about food was located in the production and consumption stages, because in some publications it refers to knowledge of food growth (i.e. production) and in others to food preparation and conservation (which are aspects of consumption).

The component most frequently mentioned was the connection between urban and rural areas (11), encouraging a relationship that generates positive outcomes for both. Some authors described how current relations are based on food resources being transferred from rural to urban areas, with few benefits for rural communities (Billen et al., 2012; Cretella and Buenger, 2016; Jennings et al., 2015; Ozor et al., 2016). Some authors proposed that urban areas can contribute with training and technical assistance, as well as help with financial and organisation aspects (Dubbeling et al., 2016; Forster et al., 2015; Morgan and Sonnino, 2010). Skordili (2013) encourages the support of urban-to-rural migration to revitalise rural communities through the renewal of ideas and knowledge. It is also suggested that there is a need for stronger social connections between rural and urban areas, and improvements to transport, processing and storage infrastructure for supporting the provision of food produced in peri-urban areas are seen as desirable (Forster et al., 2015).

The component related to social justice and equity appeared in seven publications. It is noted that socioeconomic conditions limit the choice of food and that cities face the challenge of poverty alleviation and power imbalances (Food Futures, 2007; Hamm and Baron, 1999; IPES FOOD, 2015). It is argued that UFS should address the needs of the underprivileged, create a distributed food system that increases food access, and improve production options (Edwards and Mercer, 2010; Garnett, 2014). Some examples of actions named include food price regulation, recovery and redistribution of nutritious food for human consumption, easier access to land for low-income populations to encourage self-production, and social protection mechanisms such as cash transfers (Dubbeling et al., 2016; Forster et al., 2015; Jegou and Carey, 2015; Longo, 2016).

Fair trade was a component mentioned seven times acknowledging that imports are necessary in some cases to avoid food shortages (APA, 2012; Blay-Palmer, 2010; Food Futures, 2007; Hinrichs, 2010; Sonnino, 2016). Morgan and Sonnino (2010) argue that imports might also be appropriate to satisfy some diets since

Table 5
Components related to a sustainable urban food system – health domain.

Health (n = 19)							
UFS stage	Components	PR	ID	BC	ID	GL	ID
Production	Produce healthy food	**.**	.	**.**	.	**1**	38
Consumption	Healthy food access for all	**5**	10, 17, 18, 24, 35	**1**	20	**10**	1, 12, 14, 16, 26, 27, 34, 38, 45, 53
	Support for healthier diets	**2**	24, 49	**.**	.	**3**	16, 25, 34
	Increase knowledge about food and nutrition	**3**	17, 25, 49	**.**	.	**1**	26
General	Improve physical and mental health	**1**	35	**.**	.	**4**	1, 34, 46, 53
	Consider public health impacts across the entire lifecycle of food	**1**	52	**.**	.	**1**	1

Table 6
Components related to a sustainable urban food system – social domain.

Social (n = 30)							
UFS stage	Components	PR	ID	BC	ID	GL	ID
Production	Generation, transfer, and appropriate use of food knowledge and skills	**.**	.	**1**	43	**6**	1, 23, 38, 46, 51, 53
Consumption	Support dissemination of food solidarity	**.**	.	**.**	.	**1**	25
	Generation, transfer, and appropriate use of food knowledge and skills	**.**	.	**1**	43	**6**	1, 23, 38, 46, 51, 53
General	Social justice and equality	**5**	15, 18, 31, 49, 52	**3**	20, 43, 48	**2**	1, 51
	Cultural and traditional values respected	**.**	.	**1**	43	**1**	1
	Connectivity between urban and rural communities	**6**	3, 8, 17, 37, 41, 49	**1**	42	**4**	1, 26, 40, 46
	Transparency	**1**	17	**.**	.	**2**	1, 26
	Fair trade	**1**	36	**3**	4, 22, 43	**3**	1, 16, 22
	Stronger social relations between consumers and producers	**1**	17	**.**	.	**2**	12, 26

cities are becoming increasing culturally diverse. Fair trade is pointed out as an alternative to help promoting sustainability in the case of food imports (Sonnino, 2016).

3.4.3. Economy

Twenty-seven publications mentioned components in the economic domain (Table 7) that related either to the stages of production (15), retail (4), or general aspects (20) (seven were PR, two BC, and 17 GL). Only the GL publications mention components related to retail, possibly because urban food strategies try to alter local markets. The most mentioned component was focused on having a stronger local economy (15), followed by increasing food growing in urban areas (7), support for local production (5), and having shorter supply chains (5).

The idea of having a more vibrant and diverse regional food economy is linked to providing fair economic benefits to all UFS actors (Jennings et al., 2015; Moragues-Faus et al., 2016). There is reference to the importance of increasing jobs and fostering entrepreneurship or innovation as a way to achieve this goal (Forster et al., 2015; Jennings et al., 2015). It is argued, mostly in the GL, that focusing on a local economy helps to understand imbalances. Another benefit mentioned by Jegou and Carey (2015) is that regional development is likely to generate social benefits for communities. Bristol's urban food strategy, for example, emphasises the importance of supporting independent food shops and traders, creating more markets for local producers, and promoting community-led food trade (Bristol City Council, 2013).

It is suggested that local food production and the growing of food in urban areas develops a stronger local economy (Dubbeling et al., 2016; Skordili, 2013; Sonnino, 2016), but this requires planning strategies and infrastructure in order for it to be expanded (Donovan et al., 2011; Hanson and Schrader, 2014; Sonnino and Spayde, 2014). The increase in shorter supply chains will also make clearer the impacts to consumers as well as where there is a need for better solutions. Dubbeling et al. (2016) report examples of cities in Latin America, such as Rosario, Quito and Belo Horizonte, that have already successfully developed initiatives based on local food production which are supported by local policy. Skordili (2013) mentions the case of Greece, where vacant lots of public land are being leased for agriculture production in urban areas.

There is some support for food hubs (2 publications) and alternative markets (1), initiatives that Lyons (2014) believes that can create alternatives to mainstream food supply chain. The outcomes that alternative food networks pursue are in accordance with sustainable UFS. Alternative food networks create new forms of political association and market governance, connecting and building a sense of trust among producers and consumers, and redistributing value through the chain (Bedore, 2010; Wiskerke, 2009). They also tend to deliver food of improved quality and use production practices that are environmentally conscious (Chiffoleau et al., 2016). Hence, there is potential for these initiatives to generate positive outcomes for UFS beyond components of the economy domain.

3.4.4. Environment

Twenty-five publications mentioned components in the environment domain (Table 8) that were related to the stages of production (10), transportation (4), disposal (12), and general aspects (32) (5 were PR, 5 BC, and 15 GL). The most frequently mentioned component was the reduction of food waste (12), followed by reducing GHG emissions (9), and the protection of ecosystems (8).

The literature suggests that UFS have the potential to influence food waste as well as reduce environmental degradation at the production stage. The importance of reducing, reusing and recycling food resources is highlighted, especially with regards to waste recovery (Bristol City Council, 2013; Donald, 2010; Hanson and Schrader, 2014; Jones, 2010; Metro Vancouver, 2016; Prosperi et al., 2015). A good example is Moerman's ladder from the Netherlands where food waste is reduced by: (a) sending it to a series of destinations, including food banks; (b) submitting it for reprocessing; (c) using it as animal feed or raw material for the fertiliser industry; or, (d) inputting for sustainable energy and incineration (Wiskerke, 2015).

Reducing food waste can also cut GHG emissions. Another practice to mitigate GHG emissions is reducing food transport by producing food in peri-urban areas (RUAF, 2013). There is, however, some debate in the literature regarding the effectiveness of this measure (Morgan and Sonnino, 2010). Changes in diet can be an important factor for cutting GHG emissions (Jegou and Carey, 2015), although the literature reviewed mostly focused on reducing food miles and food waste. The city of Malmö was the only example found where reduction of meat consumption was specifically identified for mitigating GHG emissions due to its higher effectiveness when compared with the local food supply (City of Malmo, 2010; Moragues-Faus and Morgan, 2015).

Considering the protection of surrounding areas, some UFS components can be related to the maintenance of ecosystem services, including conserving, protecting and regenerating natural resources and biodiversity (APA, 2012; Dubbeling et al., 2016; Jennings et al., 2015; Sonnino et al., 2014). Some publications argue for the recognition of environmental limits created by the carrying capacities of the biosphere when planning UFS (Marsden and

Table 7
Components related to a sustainable urban food system – economic domain.

Economy (n = 27)							
UFS stage	Components	PR	ID	BC	ID	GL	ID
Production	Support for local production	**1**	41	**1**	43	**3**	12, 14, 45
	Grow more food in urban areas	**1**	15	**.**	.	**6**	5, 16, 33, 39, 40, 51
	Diversity of food production systems	**2**	18, 52	**.**	.	**3**	12, 40, 51
Retail	Champion local food shops and traders	**.**	.	**.**	.	**1**	5
	Support for alternative markets	**.**	.	**.**	.	**1**	14
	Diversity of food markets and retail	**.**	.	**.**	.	**1**	40
	Create opportunities for producers to sell directly for consumers	**.**	.		.	**1**	33
General	Promote sustainable jobs and business	**.**	.	**.**	.	**1**	34
	Nurture a vibrant and diverse regional food economy	**3**	17, 49, 52	**1**	21	**11**	1, 16, 25, 26, 27, 34, 38, 40, 46, 53
	Workers in all stages are afforded with a living wage	**.**	.	**.**	.	**1**	1
	Support for food hubs	**1**	17	**1**	43	**.**	.
	More equal value distribution along the supply chain	**.**	.	**.**	.	**1**	26
	Stronger regional supply chain	**.**	.	**.**	.	**1**	45
	Shorter supply chains	**3**	10, 15, 17	**1**	43	**1**	14

Table 8
Components related to a sustainable urban food system – environment domain.

Environment (n = 25)							
UFS stage	Component	PR	ID	BC	ID	GL	ID
Production	Reduction of biodiversity loss	**.**	.	**2**	32, 43	**3**	1, 27, 34
	Minimise poor animal welfare	**.**	.	**.**	.	**1**	34
	Sustainable food production	**2**	10, 17	**1**	11	**1**	53
Transportation	Reduction of food miles	**.**	.	**.**	.	**4**	16, 40, 51, 53
Disposal	Reduction of food waste	**1**	49	**2**	21, 48	**9**	5, 26, 27, 33, 34, 38, 40, 51, 53
General	Reduction of ecological footprint	**1**	52	**.**	.	**3**	12, 14, 38
	Reduction of resources depletion	**.**	.	**1**	43	**2**	1, 34
	Reduction of GHG emissions	**2**	24, 52	**1**	43	**6**	14, 25, 26, 34, 40, 53
	Maintenance of ecosystem services	**.**	.	**1**	43	**4**	1, 14, 26, 33
	Operate within Earth's limits	**1**	49	**1**	32	**.**	.
	Protection and/or enhancement of urban and surrounding ecosystems through land-use planning	**2**	17, 49	**1**	21	**5**	12, 14, 26, 46
	Increase recycling and reducing packaging	**.**	.	**.**	.	**1**	16

Table 9
Components related to a sustainable urban food system – governance domain.

Governance (n = 14)							
UFS stage	Components	PR	ID	BC	ID	GL	ID
General	Address challenges of peri-urban areas	**.**	.	**.**	.	**1**	26
	Conscious and deliberative governance	**.**	.	**.**	.	**1**	26
	Representative governance	**1**	17	**.**	.	**1**	34
	Adopt a city-region perspective in food planning	**1**	49	**.**	.	**2**	26, 51
	Active participation of all actors in decision-making regarding all stages	**5**	10, 17, 35, 49, 52	**3**	7, 21, 22	**5**	1, 26, 34, 40, 51

Morley, 2014). This includes governance arrangements that take into account physical, geographical and ecological characteristics of the region where UFS are operating (Dubbeling et al., 2016; Jennings et al., 2015). An example comes from the Metro Vancouver urban food strategy that has a goal to create a food system consistent with ecological health, where protection of ecosystems and preparedness for the impacts of climate change are addressed (Metro Vancouver, 2016).

Finally, the components related to production advocate the adoption of ecological practices that are more biodiversity-friendly, such as agroecology and agroforestry (Desmarais and Wittman, 2014; Forster et al., 2015; Jennings et al., 2015). Reducing the impacts on soil and water resources and greater consideration for animal welfare are also mentioned (Moragues-Faus et al., 2016). The San Francisco Food Strategy, for example, seeks to eliminate chemical use as one of the ways to reduce the impacts on farmlands in peri-urban areas (Jones, 2010).

3.4.5. Governance

Sixteen publications mentioned components related to the governance domain (Table 9) (5 PR, 4 BC, and 5 GL). The most prevalent component present in all the publications was the need for active participation of all actors in the decision-making process for all UFS stages (13).

Overall, the literature calls for more democratic and participative UFS, with the empowerment of local communities as well as incremental and collective thinking.[1] Global initiatives usually do not pursue goals that represent the wishes and values of communities, that are important for developing local policies (Cretella, 2016; Hinrichs, 2010). Authors state that the decision process must incorporate different actors (such as businesses, academics, government officials and different consumers) with all their cultural diversity, in order to distribute risks and benefits in a sustainable and just manner (Dowding-Smith, 2013; RUAF, 2013). This presents a challenge but the different perspectives and experiences help to generate a multi-directional flow of knowledge, incorporating the richness of different backgrounds (IPES FOOD, 2015). According to Forster et al. (2015), The Milan Urban Food Policy Pact is considered an example of an initiative that is seeking to act on challenges related to governance in UFS by committing its signatories to planning for an inclusive, resilient and sustainable food system to integrate food policy with existing agendas, and to include all food system's actors in the process. The Turin Food Policy succeeded in including different perspectives due to the contribution of actors with different power levels, ranging from big retail companies to alternative food networks and individual consumers (Bottiglieri et al., 2016; Calori et al., 2017).

The creation of a more participatory decision-making structure is pointed by Jennings et al. (2015) as an opportunity for making consumers more aware of the origins of food and all the aspects related to it, therefore generating a better understanding of the impact of their choices. This inclusiveness needs to incorporate the perspective of both urban and peri-urban communities (Forster et al., 2015). Similarly, it is pointed out that the stakeholders of diverse sectors related to food governance should be involved, including health, transport, social welfare, and land use planning (Moragues-Faus et al., 2016; RUAF, 2013). Hence, for this broad integration of actors and perspectives to become a reality, it is stated that new spaces of governmentality involving collective thinking will have to be created (Hanson and Schrader, 2014; Hinrichs, 2010).

3.5. Resilient UFS

Ten publications were concerned with resilience. This number includes the 5 publications that refer to both sustainability and

[1] **Collective thinking** is a way of developing a comprehensive understanding of a problem by examining it from several angles and coming up with better responses. This requires embracing and employing knowledge from experience – personal, physical, social, ethical, aesthetic, sympathetic and reflective (Collective Thinking, 2017).

resilience. They were distributed between 6 PR and 4 publications classified as GL, but there were no BC.

3.5.1. Health

Four publications dealt with components that refer to the health domain (Table 10), related to the stages of consumption (3), and general aspects (1) (2 PR and 2 GL). The most mentioned components were access to healthy food for all (2) and increase knowledge about food nutrition (2). As with sustainable UFS, resilient UFS, contribute to public health enhancement through dietary improvement. Resilient UFS aim to guarantee food security, in terms of both safeguarding food provision and delivering healthy outcomes. Toth et al. (2016) mention that to increase resilience the access to healthy food has to rely on diverse networks and people have to be encouraged to establish home gardens.

3.5.2. Social

Ten publications dealt with components related to the social domain (Table 11), as well as the stages of production (2), consumption (2) and general aspects (9) (3 PR, 1 BC, 6 GL). The most frequently mentioned components were connectivity between urban and rural communities (5), and the generation, transfer, and appropriate use of food systems knowledge (5). Both components were also present in sustainable UFS.

To have resilient UFS connectivity between urban and rural areas needs to be increased to ensure food supply. Strengthening the social relationship between producers and consumers, for example, creates better opportunities for developing support networks (Keck and Etzold, 2013). This creation of social networks and connections that exist beyond institutional structures improves the ability to cope with shocks and fosters a sense of community (Custot et al., 2012; Donovan et al., 2011; Toronto Public Health, 2010; Toth et al., 2016). Communities that are engaged can recover more rapidly when facing extreme weather events through mutual aid and support (Anderson, 2015; Keck and Etzold, 2013). Keck and Etzold (2013) give the example of the city of Dhaka, where street food vendors have the ability to bounce back after shocks due to personal networks of support.

Connectivity can improve another frequently mentioned component: the generation, transfer and appropriate use of knowledge. The creation of networks can contribute to knowledge building, helping to develop capacity to cope, adapt, and transform (Anderson, 2015; Keck and Etzold, 2013). However, it is important to build knowledge from successes and failures, stemming from responses to shocks and stresses (Berkes and Ross, 2013; Larsen et al., 2008). This knowledge also needs to be transferred to the community, empowering people with information and allowing the emergence of capacity building and social learning (Berkes and Ross, 2013; Larsen et al., 2008). A simple example of how food knowledge can increase resilience is presented by Larsen et al. (2008) who argue that if Australians had better access to food information (environmental impacts, seasonality, energy input) they would be stimulated to change their diets to more sustainable practices and consequently reduce GHG emissions.

3.5.3. Economic

Nine publications mentioned components related to the economic domain (Table 12) and the stages of production (6), retail (4), and general aspects (6) (4 PR and 6 GL). The most frequently mentioned components were nurture of a vibrant and diverse local food economy (5), diversity of food markets and retail (4), and diversity of food production systems (4).

Diversity is seen as a central element in creating more resilient UFS. For example, current UFS have most resources travelling long distances and the development of a stronger local economy is encouraged, creating a more diverse and balanced system (Carey, 2013; Tagtow and Roberts, 2011). Diversity considering retail options includes having different suppliers and distribution pathways. This includes small, medium and large initiatives, allowing food to be obtained from a range of sources (Donovan et al., 2011; Hall et al., 2014; Larsen et al., 2008). A system that relies on different food sources is more likely to have multiple networks of

Table 10
Components related to a resilient urban food system – health domain.

Health (n = 4)							
UFS stage	Component	PR	ID	BC	ID	GL	ID
Consumption	Healthy food access for all	**1**	24	.	.	**1**	26
	Support for healthier diets	**1**	24	.	.	.	.
	Increase food nutrition knowledge	**1**	47	.	.	**1**	26
General	Improve physical and mental health	.	.	.	.	**1**	46

Table 11
Components related to a resilient urban food system – social domain.

Social (n = 10)							
Stage	Component	PR	ID	BC	ID	GL	ID
Production	Increase self-supply and/or community land sharing	**1**	47	.	.	**1**	9
	Ensure that food producers can maintain a livelihood	**1**	47	.	.	.	.
Consumption	Access to adequate food can be maintained in the face of shocks	**1**	47	.	.	.	.
	Increase social safety nets	**2**	29, 47	.	.	.	.
General	Social justice and equality	**1**	29	**1**	48	**1**	46
	Connectivity between urban and rural communities	.	.	.	.	**5**	9, 13, 26, 40, 46
	Generation, transfer, and appropriate use of food system knowledge	**2**	2, 47	.	.	**3**	9, 30, 46
	Capable of coping with and overcoming threats	**1**	29	.	.	.	.
	Existence of support through horizontal networks	**1**	29	.	.	.	.
	Capable of developing institutions that improve societal robustness	**1**	29	.	.	**1**	9
	Fair trade	.	.	.	.	**1**	13
	Transparency	.	.	.	.	**1**	26
	Stronger social relations between consumers and producers	.	.	.	.	**1**	26
	Capacity development on mitigation of and adaptation to climate change effects	**1**	29	.	.	**1**	9

Table 12
Components related to a resilient urban food system – economic domain.

Economic (n = 10)							
UFS stage	Component	PR	ID	BC	ID	GL	ID
Production	Diversity of food production systems	**2**	19, 47	.	.	**2**	30, 40
	Maintain food supply from the city-region (urban and peri-urban agriculture)	**1**	6	.	.	**2**	9, 40
Retail	Diversity of food markets and retail	**2**	6, 28	.	.	**2**	30, 40
General	Support for community food enterprises	**1**	6	.	.	.	.
	Nurture of vibrant and diverse local food economy	**1**	47	.	.	**4**	26, 40, 44, 46
	Workers of all sectors of the food system have livelihoods adequately supported	.	.	.	.	**1**	44
	No entity holds a disproportionate share of economic control over food system stages	.	.	.	.	**2**	26, 44

transportation as well as trading systems, thus augmenting its resilience by having several levels of built-in redundancy and avoiding the over reliance on one element (Karg et al., 2016). An example is the case of Bristol, presented by Carey (2013), where community food enterprises on peri-urban areas are expanding and becoming a new option for obtaining fresh food.

Similarly, diversified food sources need to be pursued, including food production via community and backyard gardens in urban and peri-urban areas that are supported from more geographically distant sites. Considering extreme weather events, there might be occasions when food supply from urban areas or access to global networks are impaired. Hence, a redundancy strategy needs to be in place to ensure access to both sources: global supply chains and local production. Since current UFS are predominantly focused on supply coming from areas outside of their geographical boundaries, the literature has given more attention to the need to grow food locally. Hall et al. (2014) cite backyard gardens as a way of adding resilience in situations where supply lines are impaired by conflicts, lack of resources, or extreme weather events. This might give the impression that UFS should only pursue local production, but dependence on longer chains will continue to exist as these networks are necessary for creating diversity and, as stated by Larsen et al. (2008), might be more suitable in some cases.

3.5.4. Environment

Nine works mentioned components related to the environment domain (Table 13), as well as the stages of production (1), transportation (1), disposal (3), and general aspects (9) (3 PR, 1 BC, and 5 GL). The most frequently mentioned components were: create a closed-loop system to reuse and recycling resources (4); reduce GHG emissions (3); and reduce food waste (3), similarly to sustainable UFS.

James and Friel (2015) state that mitigation of environmental impacts and associated adaptation to a changing climate is the strategy that should be adopted to reduce vulnerability. When trying to reduce GHG emissions, the emphasis should not be placed solely on reduce food miles by producing food locally. While food produced closer to the consumer in backyard and community gardens might help to reduce emissions related to food waste (RUAF, 2013), Jennings et al. (2015) state that more focus should be given to changing diets, especially by reducing the consumption of dairy and meat products that are more GHG intensive than vegetables during production.

3.5.5. Governance

Five works related to the domain of governance (Table 14) and general aspects (1 BC and 4 GL). The most frequently mentioned component was active participation of all actors in decision making regarding all UFS stages (4). As with sustainable UFS, the resilience perspective also emphasises the need for participation of all stakeholders when directions for UFS are discussed.

A new component identified for resilient UFS was the idea of creating synergies among different urban policies. Several policy domains that are the responsibility of local governments can influence UFS. These include transportation, waste management and spatial planning (Wiskerke, 2015). Hence, Custot et al. (2012) suggest a clear opportunity for generating benefits from policy integration. Similarly, topics for which municipalities are expected to develop goals, including climate change, biodiversity and public health, would benefit from improved links across urban policies (Wiskerke, 2015). New governance mechanisms should also seek to enhance deliberation and participation in UFS governance and management (Jennings et al., 2015). An example is the city of Belo Horizonte, where food security was holistically included in the urban agenda which also incorporated nutrition strategies and social welfare (RUAF, 2013).

Another important aspect mentioned in the literature is the preparedness of governance to deal with extreme weather events, hence reducing the magnitude of impacts from disasters (Custot et al., 2012). This can be achieved by creating capability to anticipate shocks and ensuring that this information is received by the members of UFS (Anderson, 2015). Early warning systems on food security threats should be developed for all stages of UFS (Custot et al., 2012).

Table 13
Components related to a resilient urban food system – environment domain.

Environment (n = 9)							
UFS stage	Component	PR	ID	BC	ID	GL	ID
Production	Sustainable food production	**1**	47	.	.	.	.
Transportation	Reduce emissions related to transport	.	.	.	.	**1**	40
Disposal	Reduce food waste	.	.	**1**	48	**2**	26, 40
General	Increase recycling and reducing packing	**1**	47	.	.	.	.
	Maintain ecosystem services	.	.	.	.	**1**	26
	Reduce GHG emissions	**1**	24	.	.	**2**	26, 40
	Protect and/or enhance urban and surrounding ecosystems	.	.	.	.	**2**	26, 46
	Closed-loop system to reuse and recycle resources	**1**	6	**1**	48	**2**	9, 44

Table 14
Components related to a resilient urban food system – governance domain.

Governance (n = 5)							
Stage	Component	PR	ID	BC	ID	GL	ID
General	Create synergies among different urban policies	.	.	**1**	48	**1**	9
	Address challenges of peri urban areas	.	.	.	.	**1**	26
	Adopt a city-region perspective in food planning	.	.	**1**	48	**1**	26
	Institutional strengthening and good governance for disaster risk reduction in agriculture sectors	.	.	.	.	**1**	9
	Conscious and deliberative governance	.	.	.	.	**1**	26
	Active participation of all actors in decision making regarding all stages	.	.	.	.	**4**	9, 13, 26, 40

3.6. Reconciling the components of sustainability and resilience for urban food systems

The main outcomes of a sustainable and resilient UFS identified by this review are shown in Fig. 1 and the numbers represent the total mentions, considering works that approached sustainability, resilience, or both. It should be noted that the mentions to components regarding different aspects related to diversity (e.g. production methods, retail option, the location of food sources) were merged. Components that were most frequently mentioned include:

- Health – healthy food access for all (16);
- Social – connectivity between urban and rural areas (14);
- Economy – nurture of a vibrant and diverse local food economy (16), and maintain and support food supply from the city-region (14);
- Environment – reduce food waste (12); and,
- Governance – active participation of all actors in decision-making regarding all stages (15).

Of the 45 components identified as being part of sustainable UFS, 29 were also present in the literature relating to resilient UFS. Considering the environment domain both approaches are concerned with reducing food loss and waste and reducing GHG emissions. Sustainable UFS have 5 different components related to reductions in ecological footprint, biodiversity depletion and resource consumption. Even if not explicitly mentioned as goals in resilient UFS, these components are aligned with their ambitions. Hence, there was no conflict in merging the two approaches in this domain.

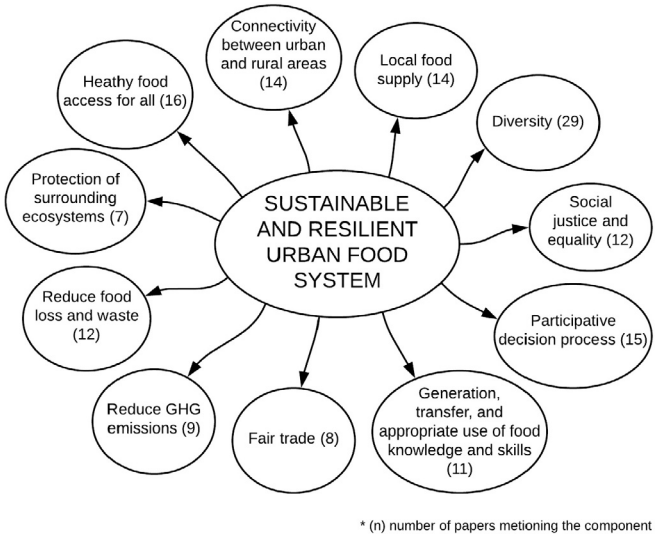

Fig. 1. Components of a sustainable and resilient urban food system.

The economic domain had components mentioned by sustainable UFS related to the strengthening of the local economy and reduction of supply chain distances. The resilience approach recognises the importance of having local food production, but it also points to the need for diverse supply sources. To reconcile the two, the focus should be kept on diversifying food sources, with local production included in that spectrum. Urban and peri-urban agriculture are encouraged in the literature (Anderson, 2015; Bedore, 2010; Edwards and Mercer, 2010; Hall et al., 2014; RUAF, 2013) because they are less common practices and is necessary to focus on increasing local sources. However, this does not mean that aiming at local self-sufficiency will suffice because resilient UFS need to have diverse food production sources regarding size, location, and business models (Donovan et al., 2011).

Of the 39 components of resilient UFS, 11 were not mentioned in the sustainable UFS literature. Most were related to social aspects (7), such as building capacity to adapt to extreme weather events due to climate change effects and good governance for disaster risk reduction. However, the components that were mentioned only by resilient UFS are not in conflict with the sustainable UFS approach but are complementary. The need for improved knowledge to adapt to the effects of climate change was only mentioned among the works that discussed resilience in UFS (Anderson, 2015; Toronto Public Health, 2010). Another aspect that emerged more strongly for resilient UFS was diversity that Custot et al. (2012) translate into the need of diversifying food production localities, channels of distribution, and even income sources.

4. Final remarks

This paper aimed to further develop the discussion on sustainable and resilient UFS using a systematic review of literature. It explored issues beyond locality in UFS to also include the diverse dimensions of sustainable development (e.g. social, environmental and economic). From the 48 works included only 5 approached simultaneously the concepts of sustainability and resilience in UFS. Yet, works covering only one of the concepts presented similar components along the domains of health, social, economy, environment and governance demonstrating the feasibility of integration between the two approaches. Considering the differences between the two approaches, they did not entail contradictions, rather they presented opportunities for creating more robust UFS.

The components discussed for sustainable and resilient UFS showed their importance in achieving the Sustainable Development Goals. These included components related to access to healthy food (16), connectivity between urban and rural areas (14), existence of a strong local food economy and food production (14), reduced food waste (12), and active participation of all actors in decision-making regarding UFS (15). It was also noted that to develop capabilities to adapt to climate change, particular emphasis should be placed on the components regarding diversity and generation of food knowledge and skills. Generation and sharing of

food knowledge and skills are a form of fostering adaptive capacity for dealing with changes in UFS potentially caused by climate change impacts (e.g. change in average rainfall patterns, increased mean temperatures, frequency and intensity of extreme weather events). In addition, diversity of food sources, distribution networks and products can increase built-in redundancy and consequently resilience to extreme weather events. An example of that is presented by MacMahon et al. (2015) in their case study on the food supply during the Brisbane (Australia) flood in 2011. Alternative supply chains (i.e. imbedded redundancy in UFS) were crucial for maintaining food provision within the Brisbane area, and overcome disruptions in the regional food distribution centre that sources the main supermarket chains due the extent of the flood.

Further research should investigate the pathways that public policy and governance can adopt to deliver the outcomes discussed in the components identified in this review. A focus on how urban planning can foster these outcomes in the form of urban food strategies or food plans at the city-region scale is also needed. It is imperative that UFS are considered by urban and regional planners, including a better understanding of their role in supporting more sustainable and resilient UFS. The energy-water-food nexus approach is a step in this direction, although care must be taken to also account for capacity building to address the social aspects connected with UFS. The use of case studies to evaluate how current plans and policies are facilitating scenarios that entail a sustainable and resilient UFS should also be considered. This includes the investigation of a growing number of urban food strategies which are already at least 5 years old and therefore warrant lessons to inform future strategies and policy development.

Another topic that can be explored in future studies is the potential of alternative food networks to enhance the components expected of sustainable and resilient UFS. Examples of benefits that alternative food networks can deliver are mentioned by Forssell and Lankoski (2015) and are linked with the outcomes found in this review, such as enhancement of local food supply, use of environmentally friendly means of production, and redistribution of power among actors. The role of alternative food networks in improving the sustainability and resilience of UFS appears to be limited because of their predominant accessibility by people of higher socio-economic levels, and observed trade-offs related with favouring exclusively local food supplies (Matacena, 2016). Nevertheless, it would be interesting to conduct case studies framed by the domains discussed in this review specifically on innovative alternative food networks. This would enable a better understanding of the role that alternative food networks are playing in UFS, including their limitations, and clarify the extent to which UFS policymakers should be directing more resources toward these initiatives for achieving more sustainable and resilient UFS.

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